Updates on PHG4KalmanPatRec

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Progress

Switch to nightly build with new TPC cluster as suggested by Carlos.

- Cluster resolution more realistic
- Memory usage significantly better than ana.49

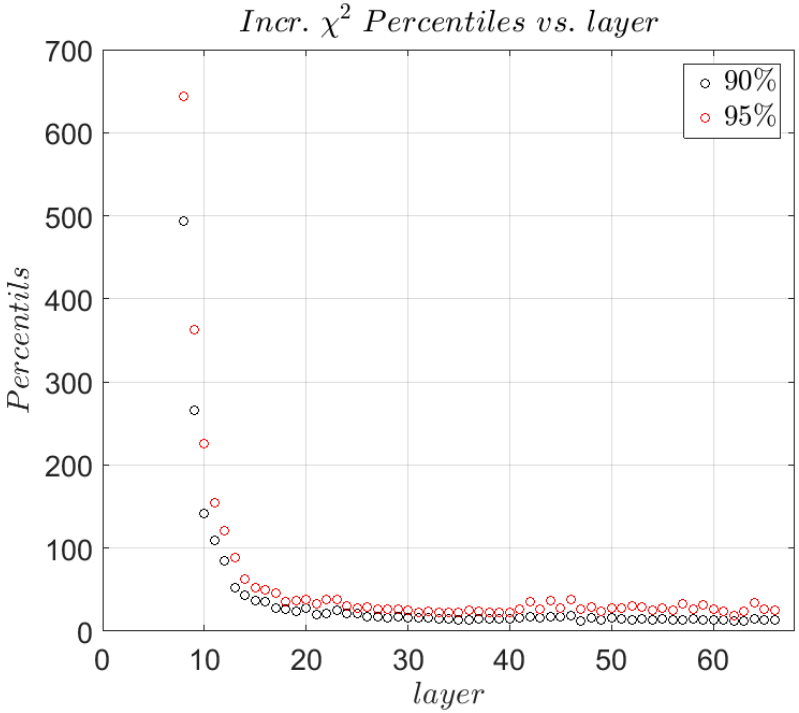
Seeding:

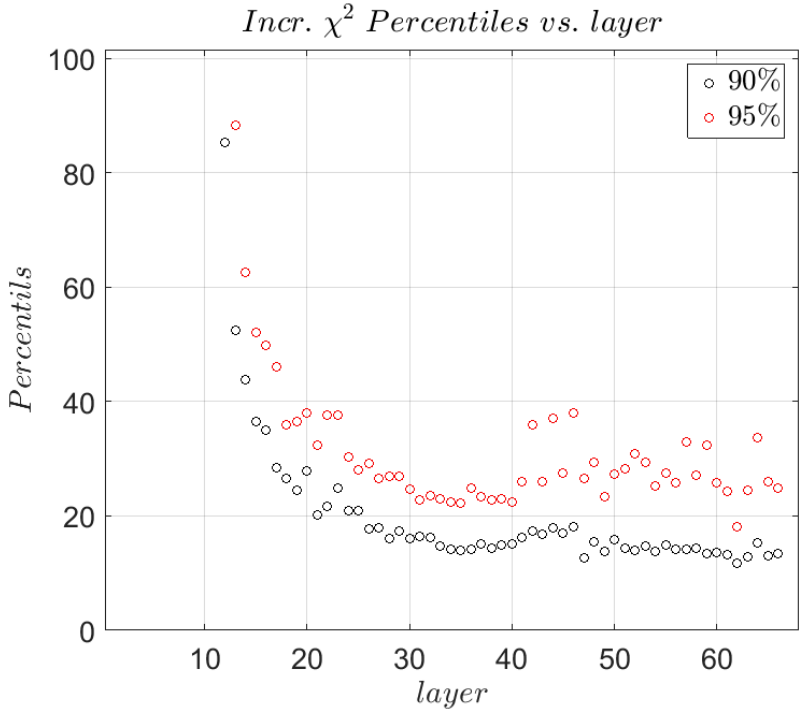
- Tuned my hybrid seed merging to achieve low ghost rate

Track propagation:

- More closely tuning with 2GeV single pions
  - Use "zero" seed for initial seed fitting - less "failed fitting"
- Working on tuning with 30GeV single pions
- Working on tuning with central Hijing

Chi2 Tuning


Incr. χ^2 Percentiles vs. layer
90%
95%
Percentils
layer
0
100
200
300
400
500
600
700
0
10
20
30
40
50
60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layer
0
20
40
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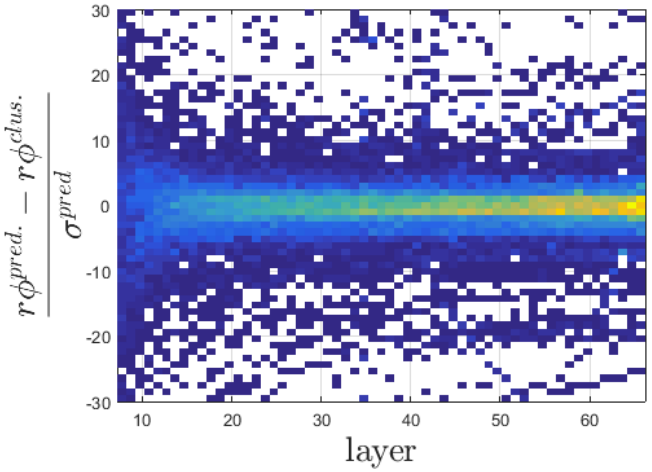
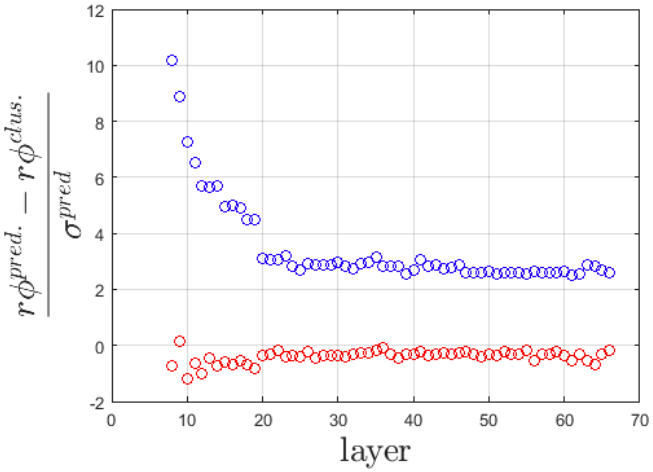
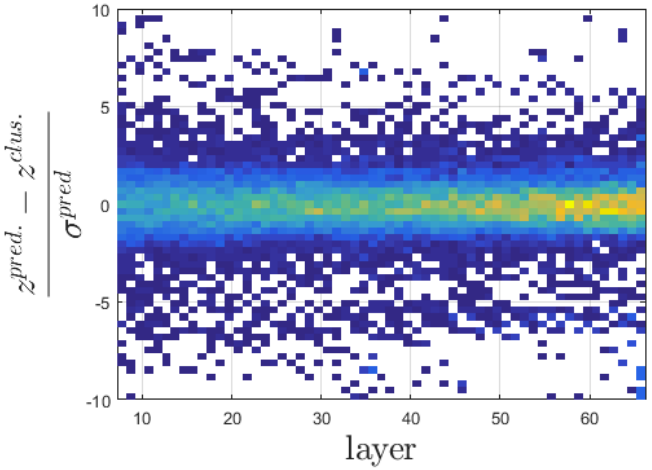
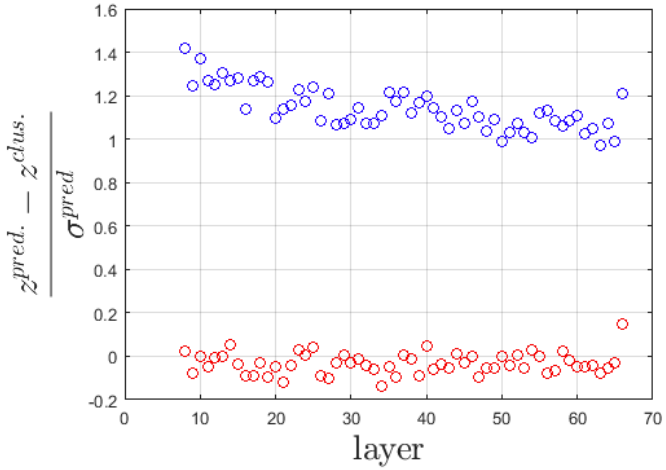
10
20
30
40
50
60

Search win. tuning - Pull

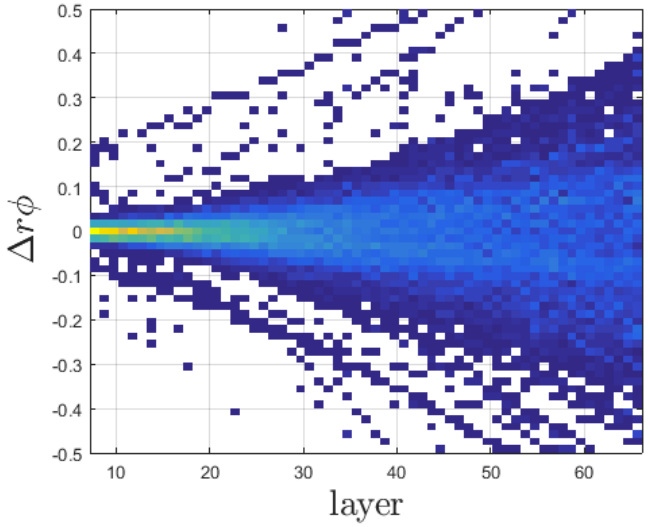


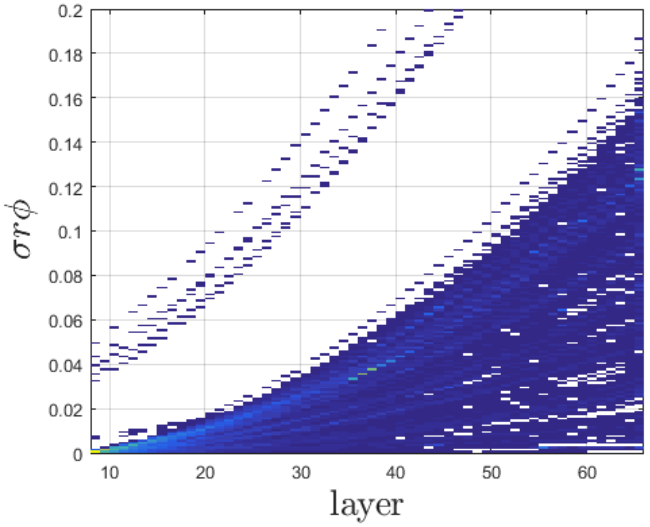


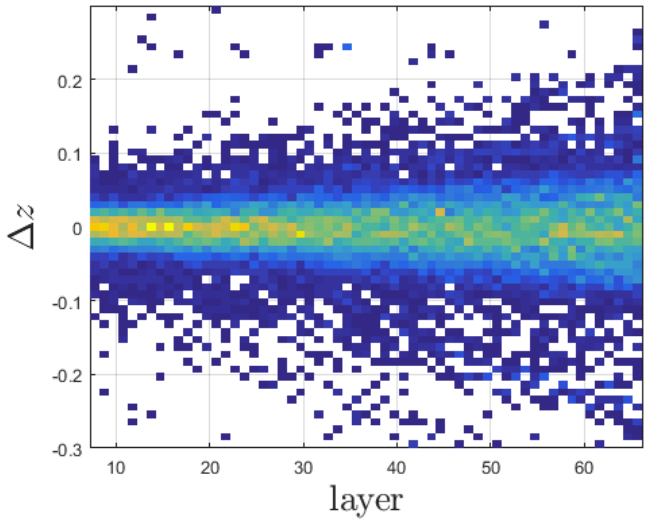


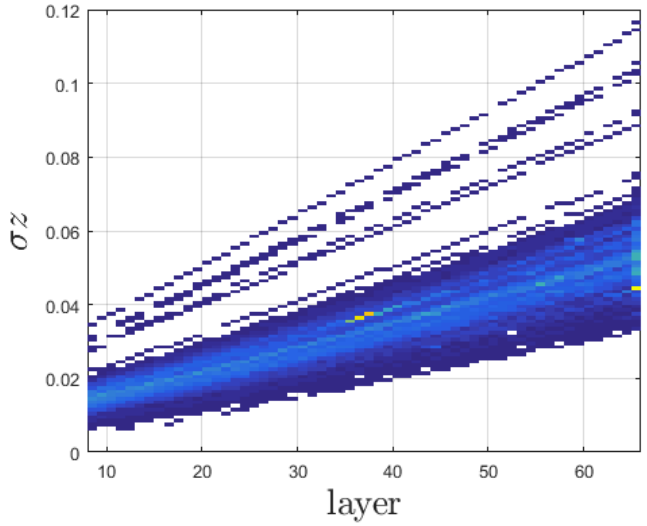


Search win. tuning - size

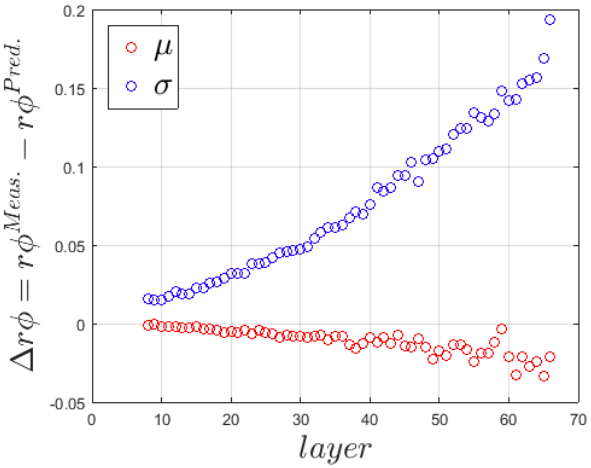


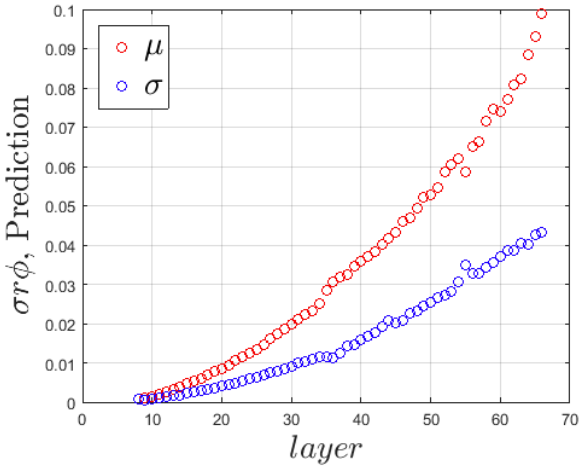


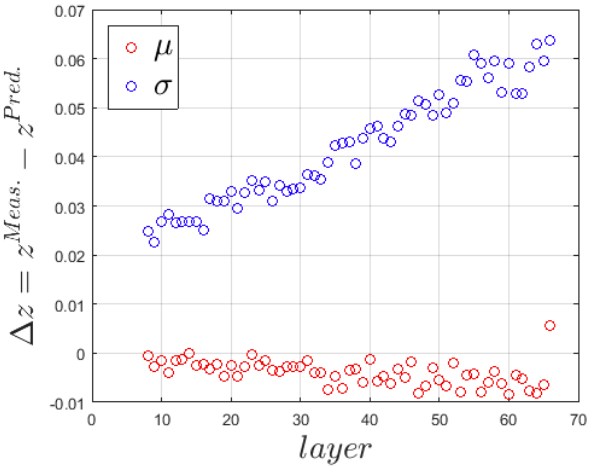


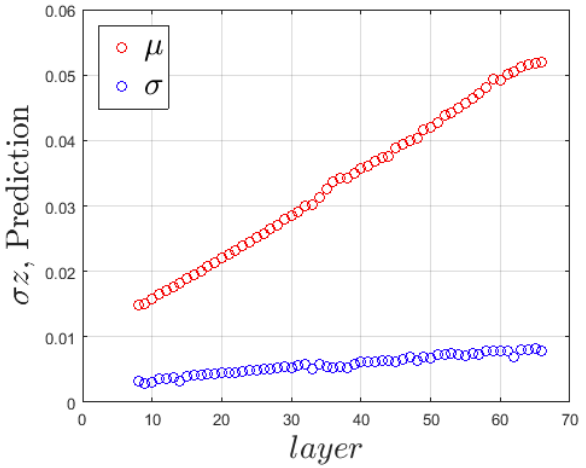


Search win. tuning - size continued









Parameters from this tuning

```
// nightly build 2017-05-04
_search_wins_rphi[8]  = 50.;
_search_wins_rphi[9]  = 45.;
_search_wins_rphi[10] = 40.;
_search_wins_rphi[11] = 30.;
_search_wins_rphi[12] = 30.;
_search_wins_rphi[13] = 30.;
_search_wins_rphi[14] = 30.;
_search_wins_rphi[15] = 30.;
_search_wins_rphi[16] = 30.;
_search_wins_rphi[17] = 30.;
_search_wins_rphi[18] = 30.;
_search_wins_rphi[19] = 30.;
_search_wins_rphi[20] = 30.;

_max_incr_chi2s[8]  = _max_incr_chi2s[8] < 1000. ? 1000 : _max_incr_chi2s[8];
_max_incr_chi2s[9]  = _max_incr_chi2s[9] < 500.  ? 500  : _max_incr_chi2s[9];
_max_incr_chi2s[10] = _max_incr_chi2s[10]< 500.  ? 500  : _max_incr_chi2s[10];
_max_incr_chi2s[11] = _max_incr_chi2s[11]< 200.  ? 200  : _max_incr_chi2s[11];
_max_incr_chi2s[12] = _max_incr_chi2s[12]< 200.  ? 200  : _max_incr_chi2s[12];
_max_incr_chi2s[13] = _max_incr_chi2s[13]< 100.  ? 100  : _max_incr_chi2s[13];
_max_incr_chi2s[14] = _max_incr_chi2s[14]< 100.  ? 100  : _max_incr_chi2s[14];
_max_incr_chi2s[15] = _max_incr_chi2s[15]< 100.  ? 100  : _max_incr_chi2s[15];
_max_incr_chi2s[16] = _max_incr_chi2s[16]< 100.  ? 100  : _max_incr_chi2s[16];
_max_incr_chi2s[17] = _max_incr_chi2s[17]< 100.  ? 100  : _max_incr_chi2s[17];
_max_incr_chi2s[18] = _max_incr_chi2s[18]< 50.   ? 50   : _max_incr_chi2s[18];
_max_incr_chi2s[19] = _max_incr_chi2s[19]< 50.   ? 50   : _max_incr_chi2s[19];
_max_incr_chi2s[20] = _max_incr_chi2s[20]< 50.   ? 50   : _max_incr_chi2s[20];
```

Parameters from this tuning

```
//! nightly build 2017-05-04
kalman_pat_rec->set_search_win_rphi(10.);
kalman_pat_rec->set_search_win_z(5.);
kalman_pat_rec->set_max_incr_chi2(30.);
kalman_pat_rec->set_max_consecutive_missing_layer(20);

kalman_pat_rec->set_max_splitting_chi2(3.);
kalman_pat_rec->set_min_good_track_hits(30);
```

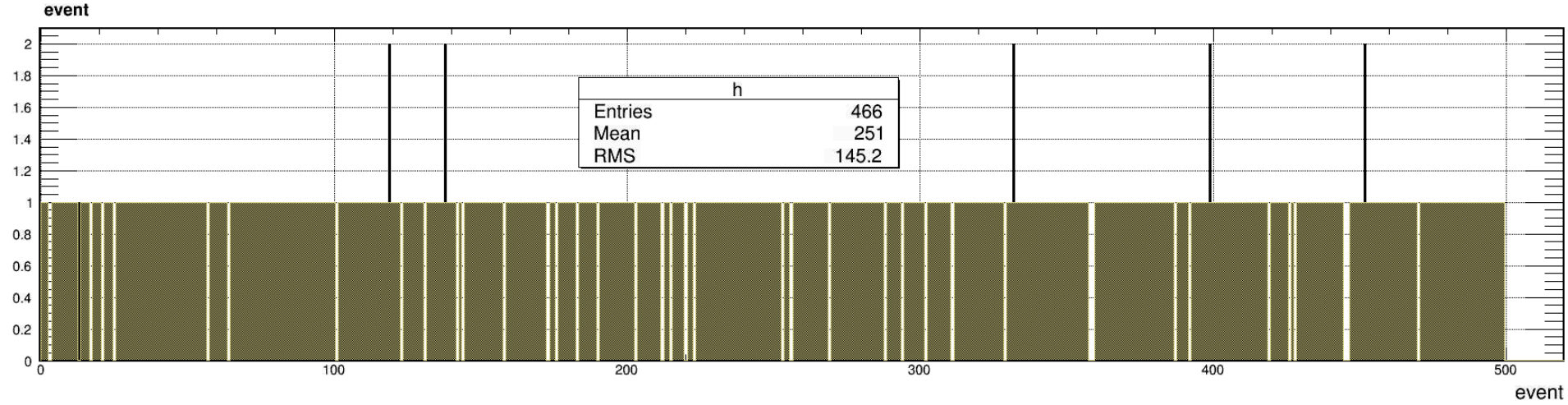
```
//! nightly build 2017-05-04
kalman_pat_rec->set_max_merging_dphi(0.1000);
kalman_pat_rec->set_max_merging_deta(0.1000);
kalman_pat_rec->set_max_merging_dr(  0.1000);
kalman_pat_rec->set_max_merging_dz(  0.1000);
kalman_pat_rec->set_max_share_hits(3); // tracks share more than this #hits are merged
```

```
kalman_pat_rec->set_track_fitting_alg_name("DafRef");
```

Hybrid seed merging

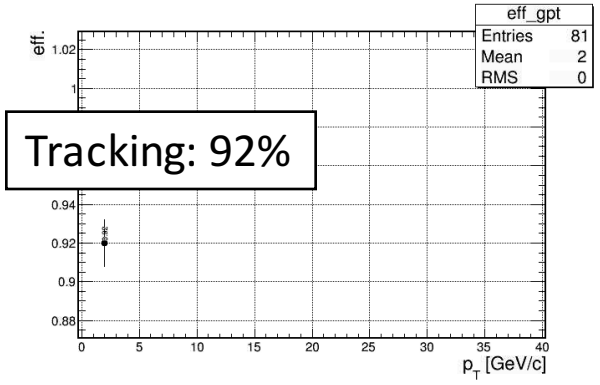
- Bin seeds by dz, dr, phi, eta
  - $\Longrightarrow$ (0.1cm, 0.1cm, 0.1, 0.1)
- Merge seeds with too many shared hits
  - $\Longrightarrow$ max 3 (>=4 will be merged)

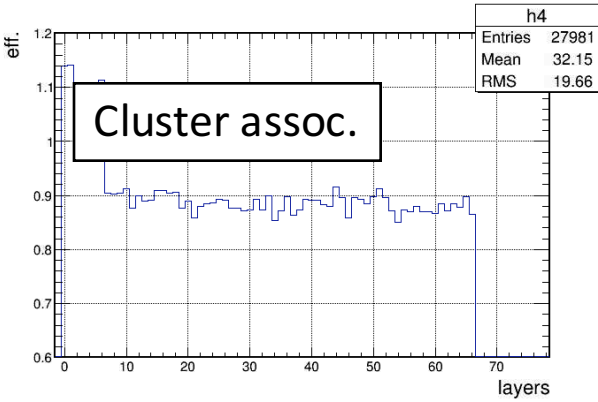
- 2GeV single pions, 6/8 seeding
- 466 in ntp_track
- 460 in ntp_gtrack
- 3 due to splitting
- Ghost rate: 0.6%



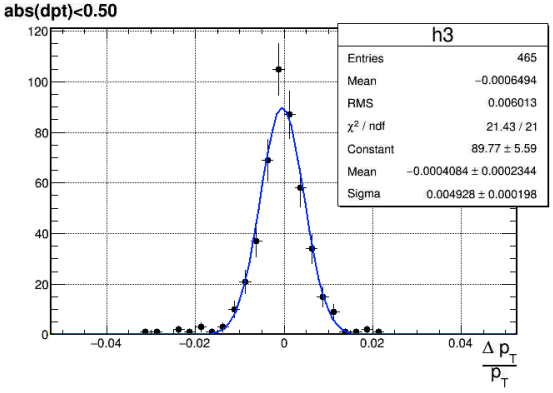
Ladder Silicon + Cylinder TPC - Single Pion

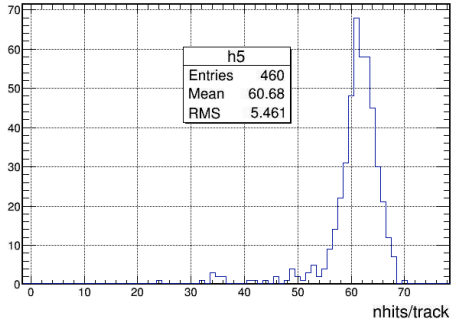
- Ladder Silicon + Cylinder TPC
- Single 2GeV pion
- Seeding: 6/8





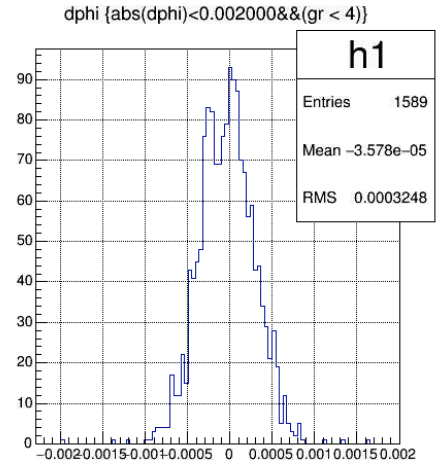

```
=============== Timers: ===============
Seeding time:                  104.92 sec
   - Seeds Cleanup:            0.276654 sec
Pattern recognition time:      19.2289 sec
   - Track Translation time:   5.95159 sec
   - Cluster searching time:   1.32869 sec
     - Encoding time:          0.0367623 sec
     - Map iteration:          0.854746 sec
   - Kalman updater time:      3.70567 sec
Full fitting time:             0 sec
Output IO time:                0 sec
=======================================
```

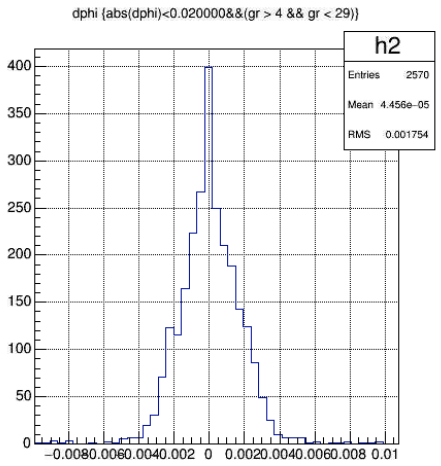


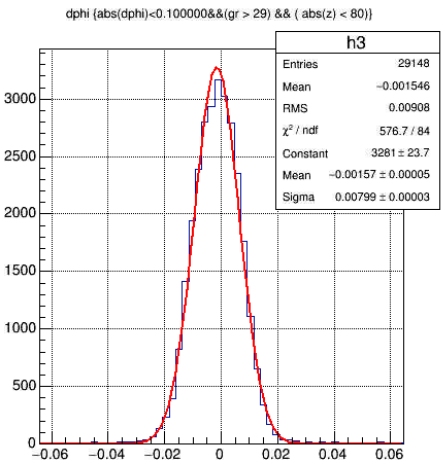


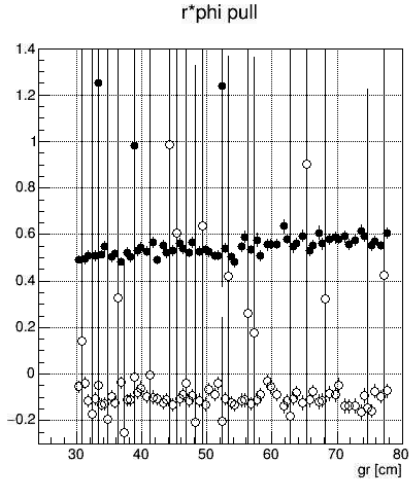
Backups

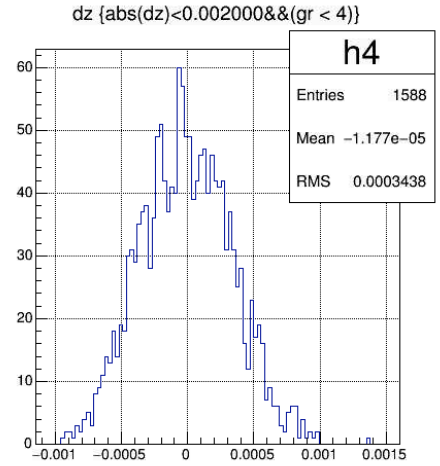
Nightly Build, 2017-05-05, 2GeV pions

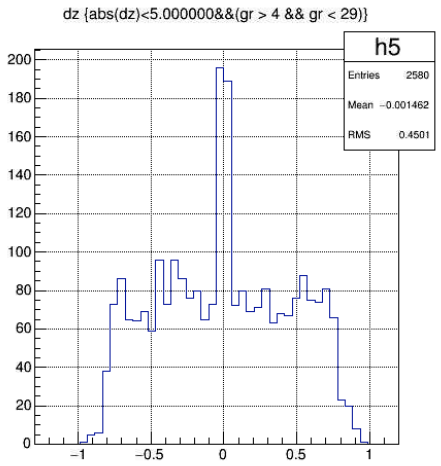


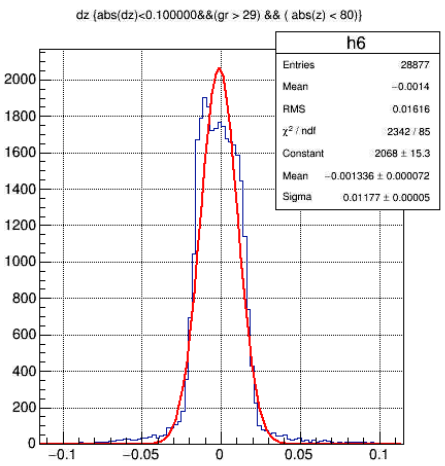


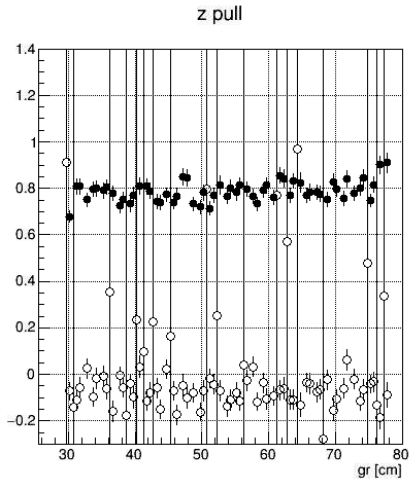








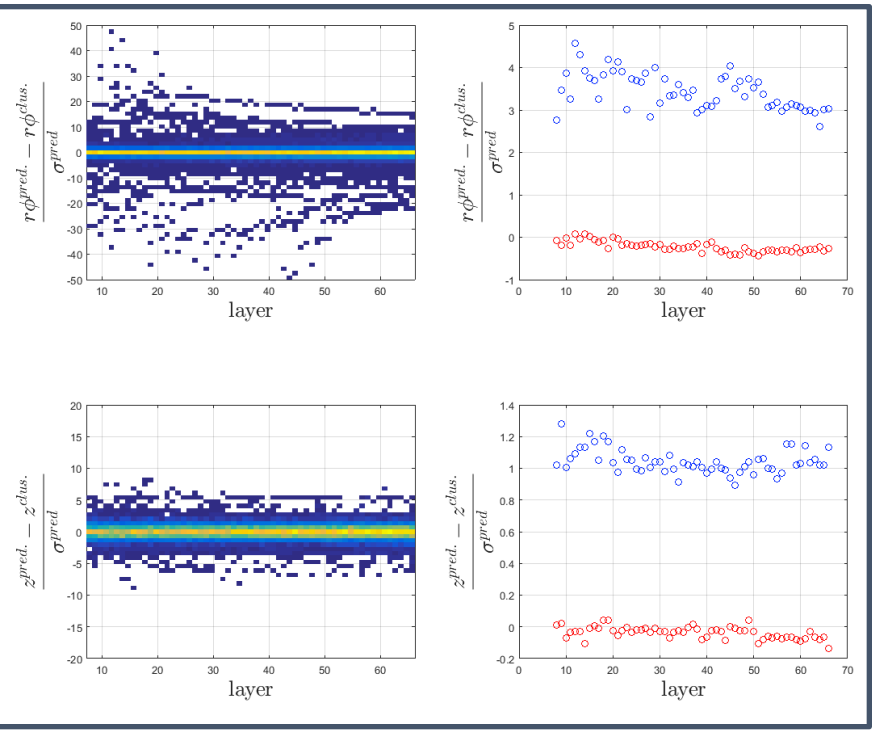




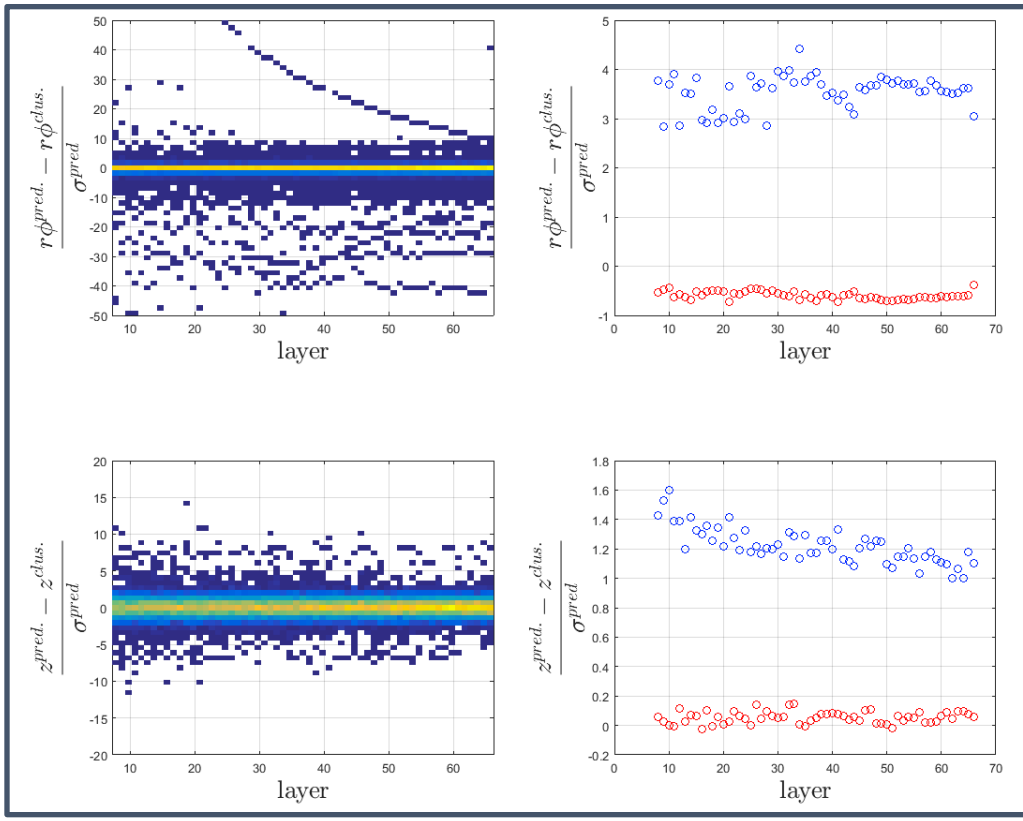
Search Win vs. Layer

- ana.49
- Single pion simulation
- pull vs. layer
- mean, sigma of pull vs. layer

2GeV

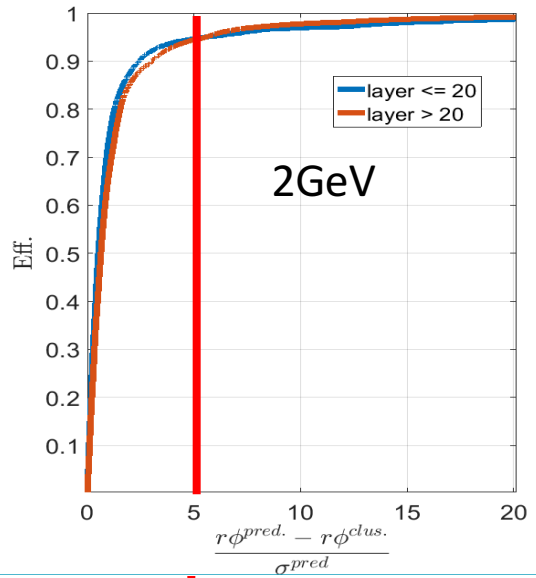


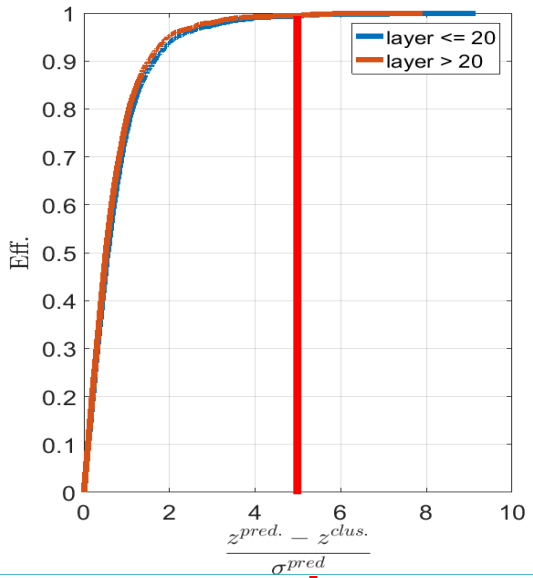
30GeV

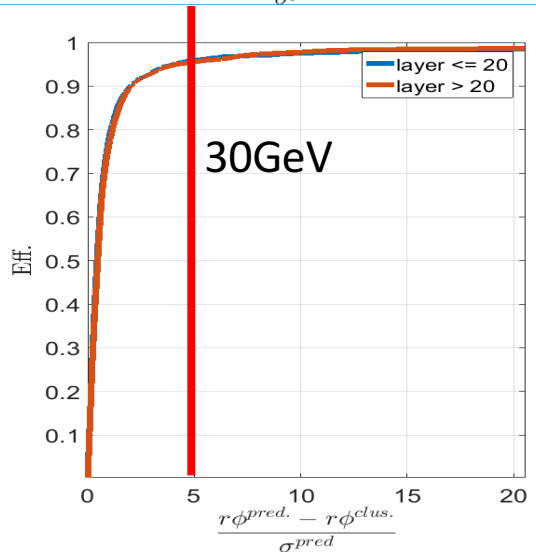


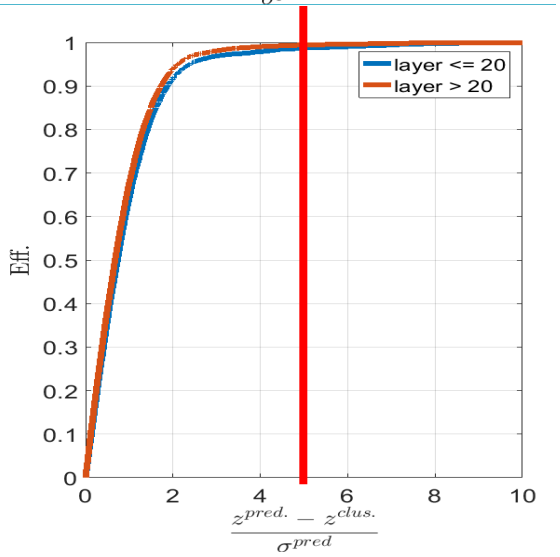
Cluster Pulls - Search Win.

- ana.49
- Single pion simulation
- CDF of |pull| for each found cluster





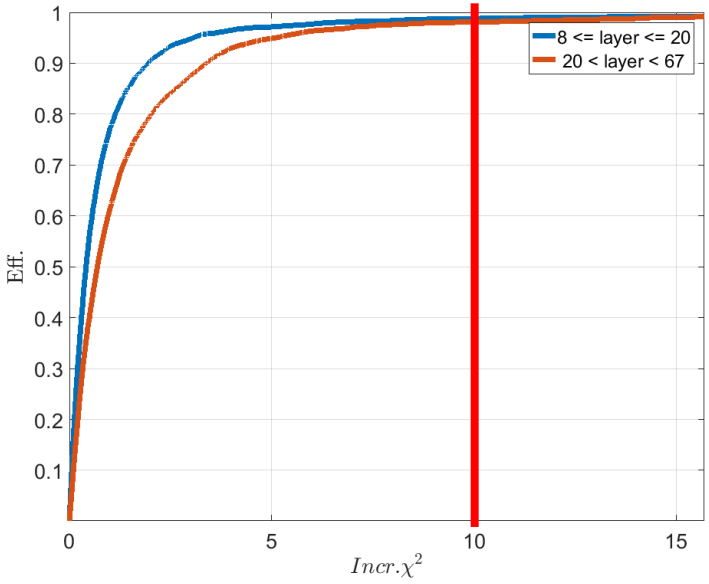




χ^2 for each found cluster

- ana.49
- Single pion simulation
- CDF of χ^2 for each found cluster

2GeV



30GeV